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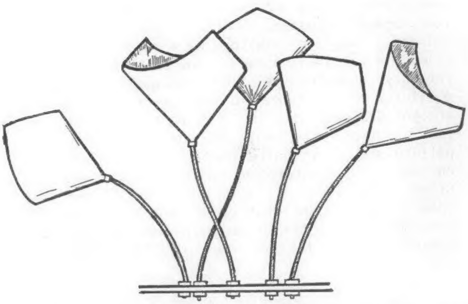
EXPERIMENTAL MUSICAL INSTRUMENTS

FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF NEW SOUND SOURCES



IN THIS ISSUE

ONE MORE TIME

Hello again. With no more pressing matters to review in this issue's editorial, I'd like to ask EMI's readers for some help in learning about a number of different subjects. Most of these topics are related to possible future articles. Soliciting help from the EMI's readership is one of our ways of gathering information from diverse sources. The hope is that a few readers will have some experience with each of them, and will be able to share that knowledge with the rest of us. Here are the topics:

Swung music: We are thinking about putting together an article on instruments which achieve phase shifting, pitch wavering, volume swells and similar scintilating effects by means of the motion of the sound source. If you have worked with or are familiar with swung trumpets, bell harps, spinning chimes, or any other such things, we'd like to hear about it.

The Pyrophone: Communications from EMI contributor Ivor Darreg sometimes feature a reference to this instrument on his ever-changing letterhead. It was an organ-like instrument whose pipes (actually glass tubes) were somehow sounded by gas flames. It was invented in 1873 by a physicist named Georges Frederic Eugene Kastner. How do flames set an air column in vibration? Or is it the glass itself that vibrates?

Tang Koa: This is an elaborate bamboo chime made in central Vietnam. The framework of moving bamboo upon which it operates is large -- many tens of feet in length, with upright poles taller than a man set on the ground -- but light in construction, and it is operated continually by waterpower from a waterfall. An article which presents a clear and complete description of this lovely traditional instrument could sit very nicely in these pages -- but who is familiar enough with the instrument to write it?

(Continued on page 19)

LETTERS

YOUR ORGANIZED, INTERESTING, AND INFORMATIVE publication (EMI) is step by step becoming a great tool.

I can still supply the two Gravity Adjusters albums **One** and **Hole in the Sky** for $7 and $8 plus $1.50 packing and mailing. These are on cassette only -- Cro2. 6% tax in California. [These are albums featuring Waterphone and all manner of other unusual instruments, mentioned in EMI's last issue's discography].

I would like to recommend to your readers the Hawaiian musical instrument section in the Bishop Museum in Honolulu, Oahu. It's been several years since I was there, but I remember a Hawaiian bullroarer (possibly mis-named) which was an empty coconut shell on a cord with a single hole at the far end. It was supposed to give intermittent whistles when swung around and around.

There were several other items of interest.

Keep up the good work.

Richard Waters

GREETINGS FROM DOWN SOUTH

I received your new tape II yesterday. Just as you say, it is very clear, so you should have success with it.

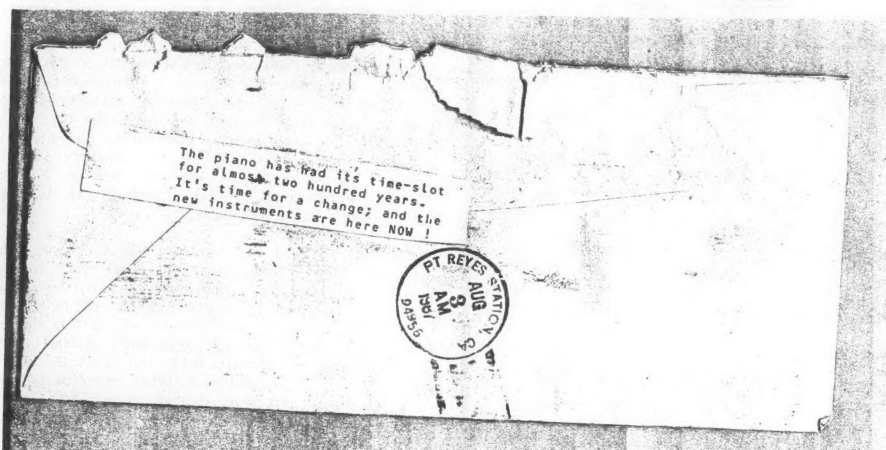
Jonathan [Glasier; editor of **Interval Magazine**] is trying to put another issue of **Interval** together, so I will probably review the tape for that.

New possibility came up: he has opened a downtown gallery which is named, and will feature, **Sonic Art** -- sound sculptures and instruments. My 8-foot Megalyra is there at present. About 15 people showed up for the preliminary event about a week ago and had a good time with Arthur Frick's instruments such as the Beepmobile and Tom Nunn's Earwarg. The Crustacean was against the front window so that not many people played it.

It's hard to predict how this gallery will do, although that is a gallery district and it complements the regular art galleries a few blocks away. August is a slow month for all businesses, so it really needs September to find how things will turn out.

Very glad you were able to get such nice pictures from the Tokyo affair to put in your magazine. This helps to show what opportunity there is for diversity and contrast with the "me-too" copycat designs of the commercial instruments. The present availability of recording equipment means that one-of-a-kind instruments can be heard, and we don't have to restrict our creativity anymore to satisfy the narrowmindedness of big mass-production manufacturers. So this latter possibility is one of the factors that will make your magazine prosper.

I got a couple of visitors as a result of the LA Times article [a feature on new instruments which recently appeared in that newspaper]. Latest publicity -- a chance to publish a page on the Ancient Greek Enharmonic Genus in a local newsletter. I have been able to compose using this pattern and it is quite possible to use it with harmony and counterpoint although the ancient Greeks didn't, so far as we know. The 22- and 24-tone scales are the most convenient for using the enharmonic. Just think: we have been denied this powerful effect for some two THOUSAND years! The



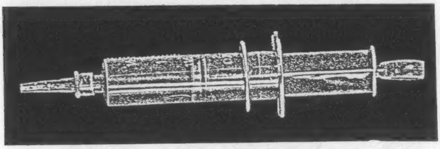
A DARREG ENVELOPE

stuffy academics and anti-imaginitive musical Establishment want to keep us enslaved to monotony, but with progress in all other arts and sciences, it is time for progress in music in spite of them.

Ivor Darreg

From the editor: EMI subscriber and contributor Bob Phillips recently shared with us one of his musical discoveries "in the spirit," he says, "of Experimental Slide Whistle Propagation." He sent along the Twomey (as in "hand that twomey to me") shown below. More properly, it is a 70cc Twomey Syringe. It is a large, clear plastic disposable syringe, commonly used for various unmentionable purposes in hospitals.

It also happens to make a fine musical instrument. By blowing flute-style over the edge of the mouth you can effortlessly produce a lovely ocarina-like tone. The push part of the syringe makes a fully functional slide (though perhaps a bit stiff) with an excellent seal. The range is about an octave and a sixth. By adding the separate narrower tip at the mouthpiece (shown in place in the illustration) you can obtain a similar range, but about an octave lower. So we see once again that music is where you find it. Thank you, Bob Phillips.



70cc TWOMEY SYRINGE/SLIDE WHISTLE (shown at about 40% of actual size)

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SUBMISSIONS: We welcome submissions of articles relating to new instruments. Articles about one's own work are especially appropriate. A query letter or phone call is suggested before sending articles. Include a return envelope with submissions.

STRUCTURES SONORES
INSTRUMENTS OF BERNARD AND FRANCOIS BASCHET
Article by Bart Hopkin

The work of the Brothers Baschet is of such interest that we have decided to run this extended introductory article on them, with an eye toward the possibility of another article to follow. In this issue, rather than focussing on specific instruments or sculptures, we will take a general approach, describing some of the acoustic innovations that underlie their approach to instrument design.

BACKGROUND AND INTRODUCTION

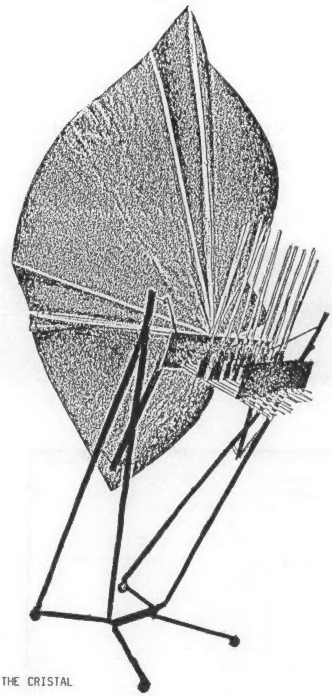
In Paris and its environs, the two brothers have been designing and building new instruments since the 1950s. Bernard and Francois Baschet, pursuing their own brand of practical acoustic research, have arrived at a set of unique acoustic systems, and created from them an orchestra of completely original instruments. Their work has included concert instruments, sound sculpture, children's instruments and environments, and large-scale public musical sculpture. It has been a long road for the two, but in the long haul they have been rewarded with well-deserved recognition and some very exciting commissions. If their work is not as well-known in the United States as it should be, well, perhaps this writing will make some small difference. For the Sculptures and Structures Sonores, as the Baschets call their works, are some of the most inventive, inspiring, and beautiful instruments of our time.

To understand the nature of the Baschets' contribution, it helps to understand an attitude that permeates their work. Francois and Bernard have spent many years engaged in a kind of practical, hands-on experimentation. They have manipulated acoustic vibrating, conducting and amplifying systems in countless ways, observing the results and modifying further; continually seeking beautiful sounds, beautiful forms and elegant methods. Their investigations have not been in the service of any theory, any dogma or any particular musical style. The real motivation behind Structures Sonores has been, simply, a love of sound for sound's sake, form for form's sake, and exploration for exploration's sake.

All this is not to say that the Baschets do not like to philosophize about their work and their purposes. They have definite ideas about what their work should achieve.

They believe first and foremost -- and this is not always a popular belief -- that it is the function of artists like themselves to make our world more beautiful, and that beautiful things are worth striving for.

They also devote a good deal of thought and effort to the ways in which the structures function socially. They design with human interaction in mind, and they watch to see the ways in which big people and small people, musically trained and



THE CRISTAL

musically untrained people, interact with the Structures Sonores, and with each other through them. They make the instruments durable, to withstand a thousand curious hands in public places, and they work to make most of them accessible and playable by anyone. In short, the products of the Baschet Brothers' explorations are made to allow for further explorations on the part of whoever wishes touch and hear.

In their larger public works the Baschets have leaned especially toward structures which have a role to play in people's day-to-day life, and which can bring music as well as visual beauty into daily routine. They have built, for example, a school bell tower, a number of public musical clocks, and some elaborate kinetic musical fountains.

Finally, the brothers have designed a number of instruments with children in mind, including classroom instruments oriented toward free sonic exploration, and musical playground environments.

It took a little time for the Baschets to arrive at the exploratory method that unlocked so many doors for them. Francois began his explorations with a study of conventional instruments:

> "If it is true that genius is ten percent inspiration and ninety percent copying over the neighbor's shoulder, then alas, here there was no neighbor! All acoustic research in my time was directed towards electro-acoustics and electronics.
>
> "For months and months I collected all sorts of instruments from the flea market. I took them apart and analyzed them. I repeated experiments I had read in library books. I attempted to improve clarinets, trumpets and cellos, but without great result."[1]

The "without great result" part of all this began to change when when Francois developed a new conceptual scheme for the purpose of thinking about musical instruments. The scheme was designed to account for existing musical instruments and then point the way to possible musical instruments. It begins with a functional definition of the term "musical instrument:"[2]

> A musical instrument is the joining of at least three of the four following elements:
>
> 1. vibrating elements: strings, vibrating rods, reeds, etc.
> 2. energizing agents: bow with rosin, wind, percussion, etc.
> 3. modulating devices: modification of length, modification of tension, multiple tuned vibrating elements, etc.
> 4. amplifying devices: sound board, sound box, etc.

As familiar examples of the application of this set of requirements, Francois Baschet looks at the violin and flute. For the violin: 1) vibrator - strings, 2) energizer - bow, 3) modulating device - plurality of strings and fingerboard to vary their length, and 4) amplifying device - sound board and box. For flute: 1) vibrator - the air flow over the aperture, 2) energizer - the wind of the player, 3) modulating devices - fingerholes and the levers and pads to operate them, and 4) there is no separate amplifying device (remember that according to the model, only three of the four elements need be present).

"Obviously the next step," Francois continues, "was to establish a table listing:

> 1) All forms of vibrators
> 2) All energy generators
> 3) All scale making devices, and
> 4) The amplifiers.
>
> "By combining these elements one by one, one could establish a sort of table, as Mendeleiev did for the basic elements in chemistry. This table would describe all the instruments already made and those to be made in the future. This illumination gave me a deep happiness which boiled within me for a week and, though it subsides a little bit each day, still remains strong to this day."

As you shall see, this kind of thinking freed the Baschets' imaginations in a manner that produced some wonderful results. To understand better how it has worked for them, we should make note of one more aspect of the Baschets' mechanical approach.

With their instruments, as with instruments in general, the life story of the sound begins with an initial vibrating element and some means of exciting it. Sometimes the initial vibrator takes a form such that it readily transmits its vibrations to the surrounding air and from there to the ear, as with the air column of a flute or the membrane of a drum. In other cases, the initial vibration may be of a form that does not transmit effectively to the air, as with a vibrating string (strings, having so little surface area, are not capable by themselves of moving much air). Most of the Baschet instruments fall in this latter category. In these situations, if the instrument is to be heard, the vibration must somehow be transmitted to some form of sound radiator which can move more air. For most instruments the link between the initial vibrator and the radiator is very direct -- e.g., strings are usually attached directly to a soundboard. Central to the Baschet's approach, however, is the fact that many materials, and hard metals in particular, are extremely efficient in conducting sound vibrations. They may do so inaudibly as long as no effective radiating surface is present, but they can do so none-the-less, even over long distances, often with amazingly little loss of energy.

The Baschets have become masters of simple vibration-conducting technology. They can initiate a vibration in one place; have it conducted to another locus for some sort of modification; and then send it to a radiator to let it be heard. This approach has allowed the Baschets to mix and match the various particulars of the table of organological elements above, and made most of their innovations possible.

OK, with all that said, let us look at some of the Baschet's specific innovations.

INITIAL VIBRATORS AND MODULATION DEVICES

The Baschets have built many instruments using familiar sources of vibration, particularly strings and various sorts of metal percussion. An initial vibrator they have used often is a little more unusual: steel rods set in vibration by glass rods stroked with wet fingers.

This original system for exciting a vibration and modulating its frequency is one of the Baschet's finest contributions. It is used on several of their instruments, including the Crystal shown on the facing page. It may take any of several forms. What follows is a description of its most common arrangement, called by the Baschets an "L fitting."

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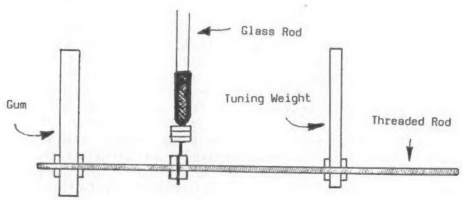
1. This passage is taken from Sound Sculpture: The Baschet Experience -- Shapes, Sounds and People, 1945-1965, an unpublished manuscript by Francois Baschet (p.27).

2. This scheme is laid out in the Sound Sculpture manuscript (see the previous footnote), and also appears in the article "Sound Sculpture: Art, Music, Education and Recreation," by Bernard and Francois Baschet, which appeared in Leonardo, Volume 20 #2, 1987. Most of the description given here is lifted directly from these sources.

Glass Rods and Threaded Metal: the L Fitting

The initial vibrator for this system is a tuned set of pairs of rods. Each pair consists of a vertical rod mounted upright upon a more massive horizontal one. The vertical rod is glass; the horizontal is threaded and made of steel. At a point farther along the threaded rod is a weight, in the form of another upright piece, a small bar of steel. The position of the glass rod and the weight on the horizontal piece are adjustable. Sets of these assemblies -- the threaded rods with their two vertical appendages -- protrude in a row from a horizontal bar of steel or aluminum, called the "gum" (holding, as it does, a set of "teeth").

THE L FITTING



OK, what's going on here?

The vibration is started in the glass rod. The player excites it by stroking with wet fingers. Now, it is important to understand that the glass rod in itself is not tuned, beyond the fact that smaller rods are used for higher pitches. It merely is the source for the vibrating energy. That vibrating impulse is communicated to the metal rod below, setting it into vibration at its own natural frequency. The Baschets compare the metal rod to a violin string, the glass one to the bow: the bow provides the vibrating impulse; the string determines the frequency.

Accordingly, if tuning is to be done, it must be done in the horizontal metal rod. Several factors come into play in obtaining the desired frequency and allowing it the greatest possible resonance. They are 1) starting with a rod of appropriate length, 2) injecting the vibration at the optimal point, and 3) forcing a node at an appropriate place, ideally about 2/3 of the length of the rod away from the gum. Adjustment for #1 can be done at the point at which the threaded rod is mounted in the gum. For #2 it can be done by shifting the location of the glass rod, and for #3 by shifting the location of the weight. It turns out that #3 -- the placement of the node created by the presence of the weight -- is most effective for fine tuning, while the overall length of the metal rod (#1) and the positioning of the glass rod (#2) can make a world of difference in resonance and resulting richness of tone.

The net result of this arrangement is a fully tunable, easily-played friction idiophone. It needs a radiator of some sort to communicate its vibration to the atmosphere, but the Baschets are at no loss in that department, as we shall see a bit later. The resulting tone is difficult to describe -- resonant, singing and full, but retaining a light and floating quality.

TRANSMISSION AND ISOLATION OF VIBRATIONS

Transmission

We spoke earlier of the importance in the Baschets' work of efficient transmission of vibrations from the initial source, through whatever intermediary steps apply, to a radiator or radiators which may be far away or connected somewhat indirectly. One of the keys to this process is that the vibration, to travel well, should be traveling through a medium whose impedance is high -- that is, it should be a low displacement amplitude, high pressure wave in a medium that is dense and rigid.

The heavy metal gum in many of the Baschet instruments serves well for this purpose, as a gathering point for vibrations from many possible sources. The vibrations of the initial vibrating system are fed from the metal rods into the gum directly. If there are to be other sources of initial vibration or additional devices for reverberation, they too are affixed to the gum so that their vibrations feed back into it. "In short," Francois says, "we simmer a complicated vibration inside the bar."

Typically in the Structures Sonores, steel bars or rods run from the gum to the radiator. All the connections in the route the vibration travels within the instrument must be made fast, eliminating unwanted rattles and minimizing energy loss in the system. The radiators, in whatever form they may take, can then take the signal and communicate it broadly to the surrounding air. In doing so they convert it to a vibration of larger amplitude and lower pressure -- which is to say, they convert the high impedance vibration in the metal to low impedances vibrations in the air.

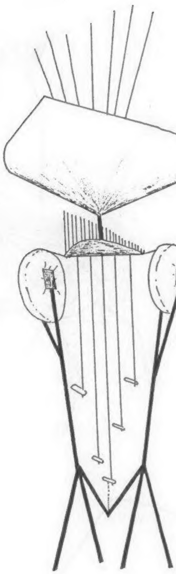
If all is as it should be, it is remarkable how effectively the system can conduct and then project the oscillation, with great efficiency and over long distances. In one very large structure the Baschets were able to use resonators joined by a steel pole to a source of initial vibration thirty-six feet away, and retain an impressive output.

Isolation

There is another possible source of unwanted noise and energy loss to be dealt with. The high impedance oscillation, given its low amplitude and the minimal surface area of its carrier, will lose little energy to the surrounding air, but it will conduct effectively to anything rigid it meets. That means that instead of sending the full strength of the vibration to the intended resonator, it may dissipate it off into the floor or whatever else the body of the instrument is in contact with. Accordingly, the Baschets have found it important to isolate and insulate their vibrating systems. How? They have depended primarily on two methods.

One is string or chain. The vibrating parts of an instrument are suspended from the instrument stand. Arranged properly, the string conducts far less vibration to the stand than a rigid connection would. It also conducts very little to the surrounding air.

The other isolation device is balloons. Balloons will readily communicate low impedance vibrations to the air (that's why they work, as we shall see, as radiators) but no balloon, aside perhaps from the proverbial lead one, will have the capacity to start something as massive as the the floor vibrating. Thus balloons can serve the dual purpose of low impedance resonators and high impedance insulators. Many of the Baschet instru-



MAN FLOWER. The sounding elements are isolated from the framework and the floor by a combination of balloons and string or chain.

ments actually sit upon balloons -- practical considerations giving rise to a peculiar visual effect. In other cases balloons insulate between different parts of an instrument, most often between the vibrating elements and an inert instrument stand.

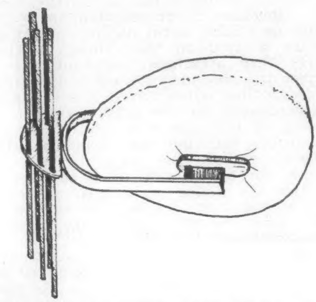
SOUND RADIATORS

When the Baschets first looked over their table of organological elements, they recognized that acoustic resonators was the element showing the least variety in the standard instruments, and the one most ripe for innovation. Accordingly, it was in this area that their innovations began.

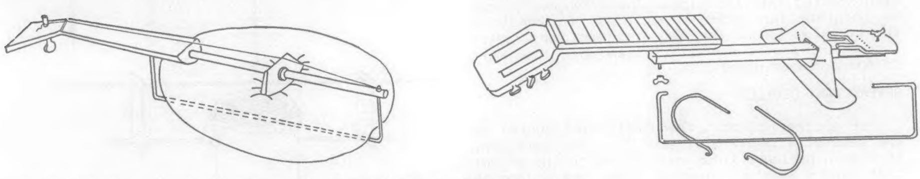
Balloons

The Baschets' first step away from standard design entailed the use of flexible inflated bladders -- that is, balloons -- in place of the standard soundboard resonator. This was first realized in the form of an inflatable guitar, originally conceived as a convenient travel instrument. It had standard neck, fretting, strings, tuning pegs and so forth, but the soundbox was replaced by an appropriately-shaped plastic balloon held in place by a minimal skeletal framework of wood and metal. The bridge pressed down against the surface of the balloon, communicating to it the vibrations. The arrangement turned out to work well, and for quite some time Francois used it in cabaret performances. In those early days, as the Baschets proceeded to develop increasingly adventurous instruments, they used the balloon resonators frequently and in all manner of different circumstances, feeding them vibrations originally excited in rods, springs, strings, and various idiophonic metal percussion materials.

The greatest difficulty in working with balloons was finding ways to mount them securely and to effectively transmit vibrations from another source to them, all in such a way that they remained able to vibrate freely. Ultimately an arrangement which came to be called "lobster pincers" proved superior. It involved a U-shaped metal piece with "bridges" on the inside ends. The bridges contacted the balloon, as if holding it between the tines of large tuning fork. Whatever it was that produced the initial vibration was made to communicate it to the metal of the pincers, which in turn communicated vibrations the balloons. Setting both sides of the balloon in vibration in this way increased the acoustic output noticeably. Many of the early sculptures used several of these resonator-balloons, producing once again, along with their acoustic output, a very peculiar visual effect.



Above: LOBSTER PINCERS, employed in a hand-held percussion instrument used by dancers in a ballet.



Left: BALLOON GUITAR. Right: the elements (sans balloon) of a more elaborate version.

Cones and Flowers

In time the Baschets evolved another form of resonator which eventually supplanted the balloons for the most part. In its most basic form it is a sheet of metal or cardboard, cut and bent to form a cone shape to give it some rigidity and project the sound effectively. Since the Baschets have never been known to stand still, the cones have metamorphosed to a variety of shapes, cut, bent and folded into a garden catalog of floral forms. The cones and flowers are usually mounted at the ends of metal rods reminiscent of flower stems. The visual effect of several of them rising in graceful curves from an instrument is lovely.

The cones may be mounted on the stems in either of two positions. In cases where the acoustic energy is not strong, the stem joins the cone at the seam along the side, allowing the cone to act like a soundboard. Where the vibration being fed in is stronger, the rod can be attached at the point of the cone, so that it acts more like a loudspeaker.

Piston Pipes

A very different approach to resonators is the piston pipe. The piston pipe is a system for efficiently transmitting a vibration from an outside source to an air column in a pipe of the same resonating frequency. A pipe of moderately large diameter (up to 42 cm) is used. One end remains open; the other is closed air-tight by a rubber membrane stretched and held on snugly by rubber bands. Two disks of plywood or aluminum reinforce the membrane on both sides, forming a sort of membrane sandwich. The diameter of the disks is slightly smaller than that of the pipe, so that they can move in and out of the opening on the flexible spring of the surrounding membrane.

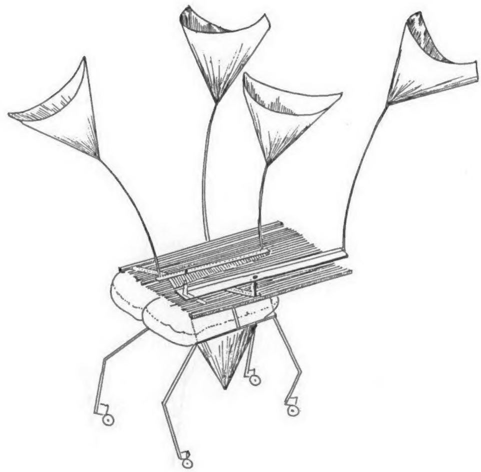
The vibration is transmitted to the membrane sandwich by a wire, metal bar or something similar which is affixed to the center of the disks. Normally this attachment is taut, so that it stretches the disk slightly outward from the pipe. Any longitudinal vibration in the attachment will be communicated to the disk. If the resonant frequency of the pipe agrees with that which is being input, coupling will occur and the sound will be effectively amplified.

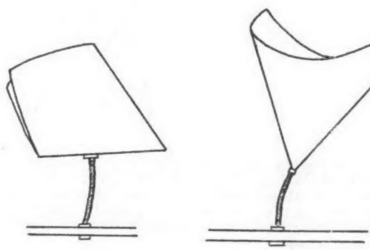
The piston pipe is designed to handle vibrations from any number of sources. In practice the source of the vibration applied to the pipe has usually been the glass rods and threaded rods assembly described earlier, with the vibration transmitted through metal bars, rods or wires.

If a scale of many pitches is to be available in instruments using this system, either there must be many pipes or some system must be found to vary the lengths of a smaller number of pipes to bring their resonating frequencies in line with the desired pitches. Since many large diameter pipes quickly become cumbersome, at one point the Baschets devised systems of telescoping pipes with a mechanism operated by the player, manipulating their lengths as vibrations of different frequencies are fed into the pipes. The arrangement made it possible for about three pipes to handle a fairly large range. The mechanism was complicated though, and proved impractical, and the instrument is now a museum piece.

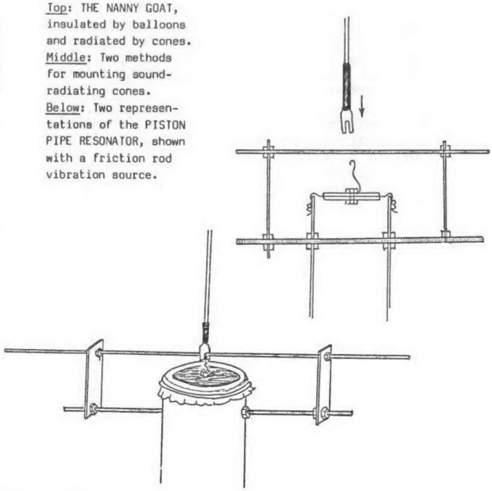
REVERBERANT DEVICES

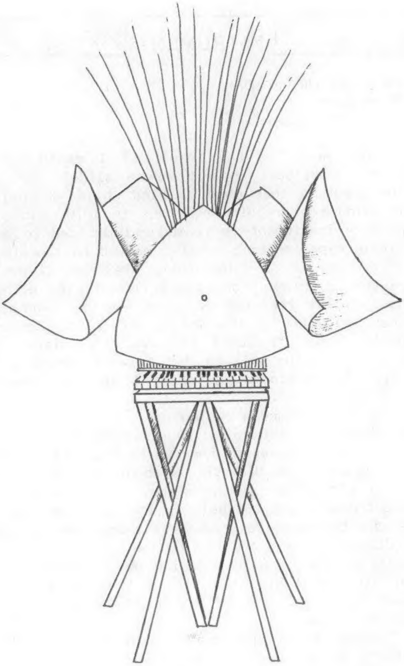
Yet another element frequently contributes to the Baschet's sound mix: acoustic reverberation. In common parlance this word refers to the effect that occurs when a vibration from some source is



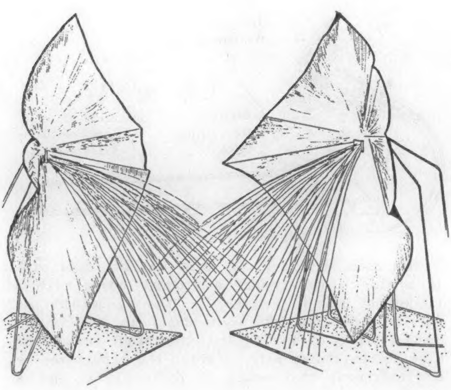


Top: THE NANNY GOAT, insulated by balloons and radiated by cones. Middle: Two methods for mounting sound-radiating cones. Below: Two representations of the PISTON PIPE RESONATOR, shown with a friction rod vibration source.





Above: ALUMINUM PIANO, with whiskers and cones.
Below: BALLET MACHE, created for a ballet -- dancers would dance or jump between the whiskers.



somehow picked up in some other medium and sustained along with the original vibration and beyond. Reverberation is usually distinguished from "echo" in that it is not a distinct repetition of the original sound, rather a lingering and slow dying away of its overall pitch and timbre. We are quite used to hearing natural room reverberation (the lingering of sound in a room as it bounces of the walls after the original sound source has ceased), and, of course, we are all awash in various forms of electric and electro-acoustic reverb these days. Used judiciously, the effect is quite natural and adds warmth and richness to most sounds.

The Baschets have built acoustic reverberation into many of their instruments. They do this by incorporating materials and appendages which pick up the vibration from the initial vibrator and then sustain it independently for a time. In concept, these materials are independent from the main resonator, and feed into it to enrich the sound of the initial vibration. In some cases, in practice, the reverberant device may to some extent take on the function of the main resonator, transmitting on its own a goodly amount of vibration to the air directly.

The devices the Baschets have used are not made to retain an unbiased replica of the original vibration. Distinctive character and idiosyncratic response all are part of the plan. They create both echo and overtones. Some can even be tuned -- that is, their response modified for overall effect or for specific frequencies. They are usually mounted with screws so they can be added or removed according to the kind of sound desired.

Whiskers

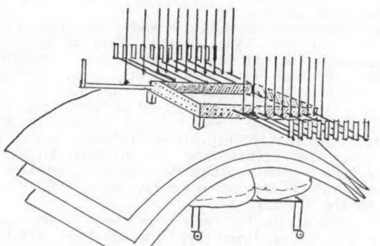
The reverberation device they have most commonly used is wonderfully simple. It has been a part of their work almost from the start. They call it "whiskers." It consists of a large number of spring steel wires affixed at one end to the body of the instrument and free at the other. They are generally between 60 and 100 cm, and within this range they are all different lengths, giving them a large range of resonating frequencies. They are quite free to bend and sway and occasionally contact on another. They pick up vibration from the body of the instrument and sustain it in their characteristically free spring steel style. The wire itself has little enough surface area that it conducts only minimally to the surrounding air; for the most part it feeds back into the instrument and the main resonator.

A great many of the Baschet instruments have whiskers. In a few cases they have cast off their supportive role and actually function as the main sounding element. In addition to adding their own peculiar resonance to the sound of any instrument, they contribute yet another strange and intriguing visual element.

Free Sheet Metal

A second approach to reverberation has been the addition of free sheet metal resonators. These are usually fairly large (as much as 150 by 100 cm), and they are mounted near their middles so that the edges are free to sag, sway, flop and vibrate as they will. They have been used in structures with balloons, but having such large radiating surfaces of their own, they may serve in practice as the main resonator for the instrument. In their work with free metal sheets the Baschets

found that they tend to have very irregular response curves, responding like glorious thunder when fed a frequency they are partial to, and rather weakly for others. The good news is, it was these explorations that led the Baschets to try increasing the rigidity of the sheets by folding and bending, and ultimately to the creation of the beautiful cones and flowers that distinguish most of their later instruments.



GLASS ROD STRUCTURE WITH THREE STEEL SHEETS

Springs, Disks, Rods and Sympathetic Strings

The Baschets have experimented with a number of other reverberant devices to provide spiced (that is to say, not unbiased) reverberation to the basic sounds of their instruments, including various arrangements of metal springs and disks. They have also occasionally employed sympathetic strings -- strings not sounded directly by the player but which enrich the sound by responding to vibrations initiated elsewhere in the instrument. We should mention here too that even without the addition of dedicated reverberation devices, the Baschet instruments are full of sympathetic vibrations due to the nature of their construction. The rigid metal assembly means that any vibrations that arise will be conducted throughout the instrument. If, for instance, one of a set of tuned rods is set in vibration, that vibration will be communicated to all the other rods, and those which have natural resonances at the same frequency will respond and add their part.

CONCLUSION

What has been described here should afford some sense of the remarkable fertility of the Baschet brothers' life in musical acoustic exploration. In a future issue we hope to provide a more complete picture of another aspect of their work, the larger-scale archetectural sculptures and installations.

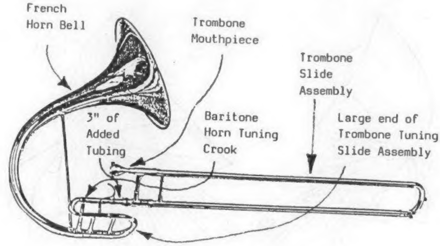
INSTRUMENTS

THE SLIDE FRENCH HORN
"Funnybone"
by Ray L. Kraemer

What would be the result if I could put a French horn bell on a trombone slide? That was the question that came to mind while working in my instrument repair shop back in 1970. Since my primary instrument is trombone I decided to do a little experimenting. What I wanted was something different but an instrument that any trombone player or lower brass player could play without any special training or study -- an instrument that would fit in the modern jazz structure. How could I get the bell to clear the slide? How could I get the bell to face forward? Using spare parts I had around the shop, I started throwing things together.

Since I needed a tuning device, I started with a standard trombone slide assembly. I cut off about eight inches of the curved French horn bell tubing where the diameter is about the same as the large end of the tuning slide, and soldered them together. To get the bell facing the right way, I used a tuning slide crook from a baritone horn and soldered one end of this to the small end of the trombone tuning slide. Adding about three inches of straight tubing to this, I then attached the bell-slide receiver of the trombone slide I was going to use.

I was still guessing as to the acoustical length of the assembly, but by this time I was in a playable situation. Testing proved that I was very close to matching the acoustical length of the trombone. A little off the bell and I was in business. I tested with an electronic frequency measuring device. Bracing was no problem as I had plenty of spare braces around. I finished the prototype and began to get serious making a cleaned up model. Incidentally, a customer after seeing it bought the prototype, mess and all.



How does it sound? The best way of describing it would be to compare a trumpet sound with a flugelhorn sound. I call it "the flugelhorn of the trombone section." The bend in the "turn-around" tube gives it just the right amount of blowing resistance without which the result may be an instrument that makes it difficult to get a

THE SLIDE
FRENCH HORN

"centered" tone. There are no wolfy tones and if played in the upper register, say above F on the ledger lines, it takes on the quality of a French horn, and even more so the higher you play. Hence its original name, Slide French Horn. Later it came to be known as a Funnybone because people seeing it commented, "What a funny looking 'bone."

The lower tones are very full and free blowing. In fact, a later model incorporated an F attachment which filled the need for the lower chairs of the band. It was taken from a King 3B tenor trombone with an F attachment, usually used in the lower chairs of the trombone section to allow for notes from low E down to the pedal tones on a standard instrument.

The next question was: If the bell is the same acoustical length as a trombone bell, why not use a valve trombone valve section? The result is a very rich sounding valve instrument not unlike a baritone horn in the lower register especially. I ended up selling two of them to valve oriented local musicians.

Because the bell is somewhat slanted up, sound projection is very good and eliminates "playing into the music stand" as so many trombonists do. And it makes for an excellent instrument for the marching band.

Players had two objections, at first. The instrument is a little heavier than a trombone, but that is soon overcome. The second problem, which might seem to be of no concern to a professional, is that the bell gives no reference to play the third and fourth slide positions. That's minor, but you'd be surprised how many professionals mentioned it.

I began using it on combo jobs myself, but the big test of acceptability came when (I hope he doesn't mind my using his name) Al Grey saw it and used it with Count Basie on a local job. He loved it.

I began taking it into a local jazz club where the best of the greats perform. The late Frank Rosilino and several others gave it a good workout on the job and seemed to enjoy it. Over the years, eight others have purchased the Funnybone, and they are scattered around the country, hopefully still using the instrument.

Production? Not at present. I have since retired from full time repairing and unless a factory picks up the idea, I'm afraid it remains an exclusive club. Any one wishing more information, feel free to contact me at 412 Pinar Dr., Orlando, FL 32825.

The author
with his
instrument

Ray Kraemer was born and raised in Toledo Ohio. He worked as a draftsman and part time musician; served in the US Army and AGD in Europe during World War II, attended Conn Vocational School in Elkhart, Indiana, and then toured with several show and dance bands as lead trombone. He moved to Orlando, Florida in 1948 where he owned and operated a music store and repair shop. He is now working part time as a repairman and playing in local dance bands.

SANTA FE RESEARCH: SOME OF THEIR WORK

by Marcia Mikulak

In the article that follows Marcia Mikulak describes her instrument building work with children. Marcia runs a research center where children and adults pursue whatever their areas of interest may be (instrument building has been just one of many) with an emphasis on an exploratory approach. Prior to establishing Santa Fe Resaearch she did similar work with children in public and private schools. Marcia's underlying purpose has been to reach a better understanding of the processes by which children and adults learn, grow, and realize their potential. Her experiences in the field have led her to question whether alternative ways of interacting with children can bring about a greater form of individual growth than what arises within a traditional teacher-student relationship. In this article she does not try to delineate specific methods (space would not allow it), but in the first half she describes some of the experiences and discoveries that have led to her approach. In the second half she presents in words and photographs several instruments designed and built by the children.

Anyone interested in learning more about Marcia's work with children may contact her at 2004 Kiva, Santa Fe, New Mexico, 87501.

Upon Bart Hopkin's request to write about the work I have done in instrument building, I found myself facing the question of how to begin. I decided to give a brief history of the path I have followed as a musician and now as an investigator of education and perception. I give this background only because of the process (as in biology: a natural outgrowth; a series of changes taking place in a definite manner) I have discovered by looking back over my life. End results don't interest me so much, but the way you or I get to where we are is interesting to me.

Music has always been in my life. My mother was a pianist, and she presented me with my first musical experiences which were always fun and full of exploration. I have studied piano from the age of five to the present (over thirty years). I received my Bachelor of Music from the San Francisco Conservatory of Music and my Master of Fine Arts at Mills College. By the time I was twenty-three years old I had both my degrees and was about to embark on a different sort of musical experience than the classical portion of my training had prepared me for.

While working on my Masters at Mills College, I slowly began to experience music and life in a different way. The Center for Contemporary Music (CCM) was run and directed at that time by Robert Ashley. It was here, while working as a work-study student, that I was exposed to many composers and musical experimentalists. The expanse of new sounds, textures, ideas, and equipment surrounded me, and I found myself spending more time at the Center for Contemporary Music than in the music department.

At this time (1971-1973) I met Pauline Oliveros, Gordon Mumma, David Tudor, Alvin Lucier John Cage, Merce Cunningham, and many others. I got to know Bob Scheff quite well and was very much influenced by his spectacular ability to perform marvelous piano improvisations. (I myself had never improvised nor played new music). I was able to participate in the compositions of many of these composers, and even at times to have them write piano compositions for me. I started a women's creative arts group that performed new music written by women. This group was called Hysteresis, and included Schung-Zee Wong, Betty Wong from the Flowing Stream Ensemble (traditional Chinese music and instruments), Beth Anderson and others. Every week the CCM presented concerts entirely prepared, directed and produced by the students. No critics were allowed. Sometimes we had an audience of five, but the work done in these settings has produced many fine composers today. The CCM won a National Endowment for the Arts special award for student concerts for two years.

Also while at Mills I met Dane Rudhyar, a composer of contemporary music, and began a five year collaboration with him. This collaboration led to many concerts and radio shows throughout California. A solo piano album of Rudhyar's music was produced in 1977 entitled **American Contemporary Music of Dane Rudhyar**, Marcia Mikulak, piano (CRI SD 372). Before I worked with Rudhyar, he heard me play. His response was completely unexpected, and I paid attention to it. Essentially he told me that I had a fine traditional technique but that his music required a new understanding and therefore a new approach to the piano. If I was to work with him, I would have to re-learn how to play the piano to produce orchestral resonating, powerful sounds. Once I had done this I would understand what true technique could mean. I bring this up because it is probably the most important thing any of us can do. Drop what we think we are so sure of, and listen when we are presented with something new. I was so curious about what he said that I just had to work with him and find out what he meant.

These years at Mills College were rich years. I first began to improvise there, working in the dance department during the summers. John Cage had left a set of wonderful Chinese tom-tom drums to the department, and there were other instruments as well. Ashley's interest in speech/music affected all the students at Mills. I began to listen not only to music, but to everything, and to become almost unconsciously aware of the subtle beauty of speech as an unbroken rhythm. Everything was new and astonishing to me. I also worked with Terry Riley while at Mills, and the work we did was deeply rooted in the slow, inner movement of sound, like the secret water that flows in underground streams. I see these years as a preparation for other events yet to come.

After my first piano recording I moved to Santa Fe, New Mexico to take a teaching position at the College of Santa Fe. I taught there for three years, during which time I became involved in

bringing new music composers to Santa Fe. In 1979 I met composer Gardner Jencks and began a three year collaboration with him that culminated in a second solo piano album entitled **Gardner Jencks, Selected Works for Piano 1942-1980**, Marcia Mikulak, piano (1750 Arch Records, S-1781).It was at this time, while teaching at the college, that I began my first work in instrument building. Children have been involved from the beginning of this work, and were the reason I built the instruments. After working with children in instrument building and design, I began to design and construct my own instruments.

I began working with children inadvertently, just as I had inadvertently picked up the intensity of the environment at Mills. I had written a grant proposal to present a series of solo piano concerts of the music of some of the composers I had worked with. At the time I wrote the proposal the local arts division in Santa Fe was not able to fund my grant as it was written. My sponsoring organization rewrote the proposal twice for me, and it ended up being one that I had not written, and which had nothing to do with my original intention. Suddenly I was to work with what are called "learning disabled children."

I set out to investigate what learning disabilities were, particularly the area of speech perception difficulties -- the area the children I was to work with tested most poorly in. I collected a lot of documentation on disabilities, but for the life of me I couldn't understand what the term meant. It seemed to be such a sloshy subject, with lots of vague ideas and concepts. So I said, "To heck with it. I won't try to do anything about disabilities. I want to do something that interests me and that I have never done before."

I sat down to think about what I was interested in doing, something that was new to me. I had done many concerts, and frankly I was tired of doing them. I came up with instrument building and other things of interest to me. I had completely put the words "learning disability" out of my mind. This was easy to do since I had never been able to understand the phrase anyway.

The grant stipulated that I had two hours per week with the children. The class consisted of twelve children, ages eleven to twelve. I am reluctant to try to present a layout of the work that we did because of the importance of the discoveries made therein, but at the end of four weeks' work, at two hours per week, these children were testing normal in their area of "disability" [full information on the tests used is given at the end of this article]. If these children were testing normal in the short period of four weeks, I wanted to know where their disability had gone. Was there ever such a thing? Is there such a thing? Much later I asked another question: what is wrong with normal children? If these diagnostically tested disabled children were testing normal in four weeks, what were we doing to hold normal children back, and what are we calling normal? Again, inadvertently, I was privileged to witness a mystery. This time the mystery could have tremendous benefits for all humanity.

I have found that discoveries of any nature are made indirectly. It is clear that working in instrument building was not the "cure" for the disabilities of these children. It could have been anything, any work, any subject. It was the way in which we did the work, and the individual freedom each of us had. I always found myself being led, indirectly, to new opportunities. I have only found these new opportunities when I was not set in a particular course or direction.

I found this first work with children to be of such magnitude that it changed my life. I would like to share with you some of the work that has been done by children that I have worked with. Because of the nature of this article, I am not able to present photos of the wide range of work the children do. Consequently, you will be seeing

Photo #1: GABRIEL AND VIOLIN

only a small selection of the instruments (unfortunately, leaving out the comprehensive nature of the rest of our work).

Before describing individual instruments I would like to say that the children and I learned how to use saws, tools, and dowelling, how to glue, stretch skins, cut metals, do sketches and drawings, measure, and much more while we worked. We learned and discovered together how things worked and when and why they didn't.

Included in this article are photographs of a few of the instruments that children have made and designed. One of the instruments is a conventional violin I made with Gabriel, a four year old boy, and the help of Brad Smith (photo #1). We studied designs of violins, then drew our own templates. We constructed the violin from pine, and it was complete, down to the sound post. I was surprised at the quality of the tone. We also decided to make our own bow. I had found someone who had a horse and was willing to cut some hair from his tail, which we used in the bow. This violin was made several years ago and is still in good shape. Some of the other instruments made by children are less complicated but are none the less beautiful in sound and design.

I found that the children were particularly good at combining several instrument sounds into one instrument. Damian's instrument shown in photo #2 is a combination of a metal xylophone, a string harp-like instrument, and a percussion one. The tin cans act as resonators and drums. Russell designed a small piano (no photo) with a working action. This action was created by making keys from pieces of slender pine that were carved into the shape of a piano key. The individual keys were positioned by drilling holes through each key (at exactly the same point on each one) and putting a dowel through all of them. Tacks were put into the back of each key. As each key was depressed, the back was lifted up and projected onto the string.

The long double-necked instrument in photo #3 is one of my favorite instruments. This one was made by Gus, a boy of seven, and it was his decision to construct the instrument with two necks instead of one. This design was based on an African instrument. It has a beautiful sound when bowed. Also, the necks bend slightly when pressure is applied. This produces a haunting, wobbly sound in the pitch which can be controlled to some degree by the pressure put on the necks.

Photo #3: GUS' DOUBLE-NECKED INSTRUMENT

Photo #2: DAMIAN'S

Seth made an instrument similar to a guitar. The body of his instrument (photo #4) was covered with rawhide, and was strung with guitar strings. Wooden pegs were carved out of pine. The small harp (not shown) made from a tetrahedron was strung on one of its four sides. (A tetrahedron is a four sided polyhedron with four equilateral triangular faces.) One side was covered with rawhide. Two accordion pleated fans were added on the edges of the harp to act as resonators. Damian's slit drum (not shown) was constructed from cherry and pine. The slit pattern was designed by Damian. Two mallets were made from large super balls that were drilled and glued to dowels.

Andrew designed a "steel drum" from tin cans mounted on an equilateral triangle (photo #5). The triangle was bisected at the midpoints of each vertex, which gave us four smaller equilateral triangles. Into each smaller triangle was placed a tin can. He designed a neck and waist strap so that his hands were free to play the instrument. The mallets were made from super balls.

Photo #7: ROBERT'S MARIMBA

Photo #4: SETH'S GUITAR-LIKE INSTRUMENT

Ellie made a large (3 ft.high) tetrahedron harp from pine (photo #6). One face of the tetrahedron was stretched with rawhide. Pegs were made from pine by carving them to the correct size. Another face of the tetrahedron was strung with guitar strings. The rawhide acts as an effective sound resonator. Tuning initially was somewhat arbitrary, but intervals of fourths and fifths were arrived at.

Robert designed a wooden marimba, whose frame was made entirely from branches that he found and cut (photo #7). The frame was tied with jute rope,and not one nail or dowel was used in the entire instrument. The wooden keys were made from

Photo #5: ANDREW'S "STEEL DRUM"

Photo #6: ELLIE'S HARP

pine (hard wood would produce a much better sound) and were tuned by carving oval shapes about a half inch thick on the underside. Each key was drilled on both ends and the jute was woven through. The entire keyboard was then hung on the frame. Tin cans were used under the instrument as resonators. Wooden mallets were made from circular pieces of cut pine and attached to wooden dowels.

Cam made another type of wooden marimba, constructed from pine as well. His resonator was a large wooden box with wooden keys suspended on rubber weather stripping. Holes were drilled into each key and nails were put into his sound box to hold the keys in place. The rubber stripping was used under each key to cut down on unwanted vibrations and to avoid dampening the sound (photo #8).

Two of the instruments I have constructed are included in this article. The first is called a Harp Resonator (photo #9). It is the largest and most complex of my own instruments to date. It stands about six feet high and about four feet wide (at its widest point). The instrument was designed around a tetrahedron. It has a tetrahedron in the center or heart of the instrument, and the entire structure grows outward from the tetrahedron in a golden section ratio (the structure of many spirals and growth patterns in nature, e.g., DNA). The frame is made of steel and was welded together by Brad Smith. The inner chamber of the instrument is covered with paper that has been painted with fiberglass resin. Each fan was individually made by accordion pleating and was also painted with fiberglass resin. The fans are attached to the large frame by screws. The entire unit is tightly put together in order to eliminate buzzing. The fans act as highly effective resonators and project the sound outward. Along the outer frame I strung the harp resonator according to golden section lengths. The strings, along with the metal frame, are bowed with a bass bow. At times, especially on the very low notes, the floor and room with reverberate with the intensity of the sound. The sound is extremely difficult to describe, but is very rich with overtones.

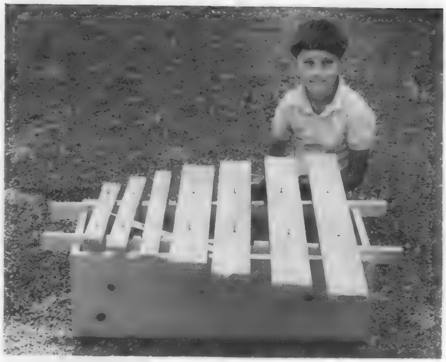


Photo #8: CAM'S MARIMBA

Photo #9: HARP RESONATOR

Another instrument I made with the help of Brad Smith is a gamelan instrument (not shown). It is constructed from large coffee cans that are welded together to form cylinders that act as resonating chambers.

Above each cylinder is a small gong. These were made by heating steel disks and then pounding them into delicate, slightly cupped shapes. Each gong is a different size. The tuning was arbitrary. Brad used the exhaust pipe from a car to make the actual frame, and gave the instrument a long slender tail. This instrument is played with hardwood and softwood mallets. We have experimented with the coffee can cylinder/resonators by filing them with water to find the exact air space to best resonate the pitch of each gong. This has increased their volume. All in all, the instrument is very delicate, each gong producing long ringing tones.

I have also experimented with spherical resonating chambers in cello-like instruments and have spent time with designs based on instruments from other cultures.

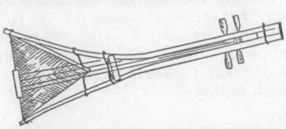
At the present moment I run a small research center where children come to investigate whatever interests them. We look into and explore any subject they may choose. The children initiate the work we do here, and we follow the children. Our investigations have taken us into chemistry, biology, astronomy, photography, spherical geometry, and much more. The adults, who act as assistants, bring their interests and develop them here. We do not teach in the sense that the adult is the center of attention and authority.

At a time when, more than ever, we must see our world as one world and not separate sovereign nations, I feel that the presentation of work done by children is of critical importance. The importance lies in the fact that children spontaneously embrace the world and eagerly participate in its exploration. Nature implants in us an intense curiosity, which serves as our teacher. We must come, and quickly, to a new understanding of the child, his work, and his place in our lives.

A NOTE ON THE DIAGNOSTIC TESTING REFERRED TO IN THIS ARTICLE

Ms. Mikulak reports the surprising result that children who had been diagnosed as learning disabled tested normal in their areas of disability after four weeks' work with her. Information on these tests follows:

The children who worked with Ms. Mikulak were students in the Santa Fe city school system who had previously been labeled as learning disabled by school personnel. A group of graduate students from the University of New Mexico at Albuquerque, overseen by professors from the Department of Guidance and Counseling, College of Education, observed and videotaped Ms. Mikulak's work with the children, and conducted standardized tests on the children immediately prior to and following the four week period at the request of their professors. The graduate students themselves did not work directly with the children. The test used was the Halstead Speech-Sounds Perception Test. Of the 10 children tested both before and after, nine had increased scores, the average increase being 9.5 correct answers out of 60 possible. No control group existed in connection with Mikulak's work. The standard deviation for the test results was calculated at $p<.05$. Professors Robert Micali and Clifford Morgan of UNM confirmed the potential significance of these results in letters to Mikulak in February 1980.



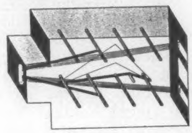
BOOKS & RECORDINGS

**PAUL PANHUISEN/JOHAN GOEDHART:
LONG STRING INSTALLATIONS 1982-1985**

Set of 3 Lps accompanied by a full sized book, available from Het Apollohuis, Tongelresestraat 81, 5613 DB Eindhoven, The Netherlands.

Long String Installations is a boxed set of three records and a book presenting the installations that Paul Panhuisen and Johan Goedhart have created over the past several years in locations in Europe and North America.

In order to hear the sounds recorded here as they were meant to be heard, you should understand that what is being documented is architectural space. Panhuisen and Goedhart have arranged to install musical strings of tens or hundreds of feet, from wall to wall, wall to floor, doorway to pillar and so forth, in an interesting and diverse set of buildings. They have strung up warehouses and factories, courtyards, theaters, classrooms, museums, an old winter circus building, a modern office building staircase, an old meat market, a gymnasium and a chapel. Some of the structures are new and some are old; some currently in use and some abandoned. In each case the choices involved in the placement of strings were seen as acts of interpretation of the space. The straight lines of the long strings highlight the geometry of the architecture, connecting its formal elements and at the same time dividing it into parts.



Long strings work better than other sorts of acoustic systems for Panhuisen and Goedhart's purposes, because they make visible the translation between space and sound. The physical nature of sound can be read by the eye in the movement of the strings: fundamental and harmonics, standing waves as well as progressive waves, occur on a scale that can be observed as well as heard.

If you don't think about the architectural aspects -- about the form of each space, the way it has been strung, and how that is manifested aurally -- there is a good chance that the sound recorded here will bore you. If you do think about these things, the recordings take on meaning. You may or may not hear them as music; but you will hear them as meaningful sound.

All this undoubtedly is why Panhuisen and Goedhart present the recordings and book as one package, and have gone to the expense and trouble to make the sort of book they have. It is oversize (matching the size of a record jacket) and although it is all black and white, the many large photographs are clear, explicit and attractive. It opens with a short introduction by American sound-explorer/musician Arnold Dreyblatt, followed

by a longer text by Panhuisen describing some of the thinking and the processes behind the work. The remainder of the book contains verbal descriptions, photographs and diagrams (some of the latter reproduced here) of just under forty installations.

The reader/listener's job is to make the connection between the sound recording of a particular installation and its depiction in the book. It's not the same as being there, but having the two together does make the difference between a superficial experience and an engaging one.

OK, what about these installations?

There are too many to describe here, but perhaps we can make some generalizations and then look more closely at one or two.

Most of the spaces chosen for the long string installations are large. The layout of the strings is usually based upon a visual interpretation of the space. Prominent features such as windows, doorways, pillars and such tend to become focal points in string layouts, and peculiar angles or shapes in the structure are likely to be repeated or highlighted in the layout as well.

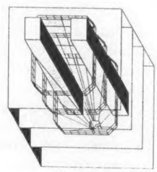
Tuning of the strings from the standpoint of sound alone is not terribly meaningful: They are usually long enough that the fundamentals are subsonic. Vibrations occurring in the audio range are far enough up in the overtone series as to be jumbled close together and have little harmonic meaning, and a liberal complement of nonharmonic noise is present as well. In some installations Panhuisen and Goedhart tune the strings nonetheless, but in an operation that is visual and geometric more than aural. Harmonic relationships are created in the observable ratios of string lengths. Just as the shape of a grand piano or the pattern of lengths on a set of panpipes has a musical message we all can recognize visually, so the patterns of string lengths in the tuned installations have visual musical import, even if harmonic relationships are not readily discernible in the sounds produced.

The strings may be made of various materials: music wire, wire of other metals, rope and twine, monofiliment nylon, or dental floss. Sometimes Panhuisen and Goedhart are able to take advantage of some resonant surface to project their sound, and sometimes they build sound boxes or soundboards in some form or other. More often the strings are amplified electronically, using one or another form of pickup.

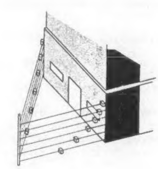
Panhuisen and Goedhart usually put on a performance with each new installation soon after it is assembled. Rehearsals for these performances are minimal, and the performances are more along the lines of a public exploration of the possibilities of a new instrument. Panhuisen often sings as well, in improvised accompaniment to the sounds of the strings. They are also sometimes joined by other musicians. In some cases Panhuisen and Goedhart have devised automatic systems to sound the strings continually, so that they remain active even when human performers are not on hand.

Let's look more closely at two installations.

Paraphrase: Hommage to Franz Liszt was set up in the entry hall of the cultural center, Almassy Ter, Budapest, Hungary. This is a very high, narrow space in which several floors above opened out onto the vertical entry hall space on four sides. Panhuisen and Goedhart suspended a grand piano from the high ceiling, so that the piano hung just above the floor. The weight of the piano provided the tension on the strings, which were amplified by transducer pickups. During the performance, as the strings were plucked and struck by the performers, several Walkmans (Walkmen?) sitting on the piano played a fragment from one of Liszt's Hungarian Rhapsodies in an overlapping manner.



The Paal was installed at Municipal Museum, Arnhem, The Netherlands. It was set up using the outside walls of the building, with sets of wires running from two corners, to the point where they met at an upright pole some distance away. Each wire string had a resonator box of wood located somewhere along its length, dividing the sounding length in two. The "tuning" of the wires -- that is, the placement of these boxes, which determined the sounding length of either side -- was done in accordance with a Fibonacci series, with the box on each successive string farther from the side of the building. At the pole end of each string was placed a small motor which automatically plucked its string with a plectrum as it rotated.



The performances included on the three Lps come from thirteen different installations. Some recorded performances stretch out for twenty minutes and more, and some are relatively brief. As a matter of personal opinion, I have found that those which use electric amplification as part of the installation are not aurally satisfying -- they lack clarity in the high end and body in the bottom, and the recorded sound fails to reflect the grandeur of the installation. More enjoyable are those which have been recorded directly, without having first passed through some sort of amplification system.

EDITORIAL, continued from page 1

Leaf oboes, grass oboes and such: When I was young I learned to make a wonderfully loud, flexible (hard to control), and strangely human-sounding double reed by folding a particular kind of leaf in two. I achieved a modest degree of pitch control and mastered a number of peculiar effects with it. I have since discovered that my form of leaf oboe was just one of many types fashioned by people all over the world. There are similar instruments made using grass and flexible tree barks as well, not to mention candy wrappers and such. If a number of people write in with descriptions of similar instruments, perhaps we can put together a feature for a future issue on music for hunter-gatherers.

Banda mocha: Speaking of leaf oboes -- Banda Mocha is an instrumental ensemble found in one region of Equador. The musicians play gourds (used how?), combs, flutes, drums of various types, cymbals, and, yes, leaves. Can anyone tell us more about this?

Underwater instruments: EMI has occasionally gotten word of people designing instruments specifically for use underwater. But, aside from waterphones (which are normally used on dry land but are also effective underwater) we've never reached anyone actually producing submersible music to learn more about it.

If I think longer I will come up with more topics I would like to ask the readership about, but I will stop here. If you know something about any of these subjects, I hope you'll write EMI. Then we can share the information either through the letters section or in future articles.

RECENT ARTICLES, continued from page 20

BUILDING THE TAR by Nasser Shirazi describes the traditional approach to the construction of this Persian plucked string instrument. The Tar is an unusual and interesting instrument form, using an exotically-shaped body carved from a single piece of wood, tied gut string frets, and a resonator membrane of of unborn lambskin.

THE EFFECT OF BRACING ON GUITAR RESONANCE by J. & O. Jovicic recounts a series of controlled experiments assessing the results of different bracing patterns on guitar soundboards.

'WAY DOWN UPON THE AMAZON RIVER by John Curtis is an enlightening discussion of the state of commercial exploitation of the increasingly rare exotic hardwoods which instrument builders favor. The author works at Luthiers Mercantile, which imports these woods for builders and recently sent one of its employees to Brazil for first hand knowledge of the situation.

NOTICES

Xenharmonikon, An Informal Journal of Experimental Music, has changed its address to Xenharmonikon, c/o Daniel Wolf, 370 S Mills Ave., Claremont, CA 91711. Subscription rates are $8 per single issue. A limited number of back issues are available -- write for prices. The contribution deadline for Xenharmonikon XI is Sept. 1, 1987.

WCVF radio in Fredonia, NY is initiating the second season of its program **Playing It By Ear.** The program features artists who use sound as their medium of expression. It will be made available to over 300 radio stations nationwide through the Intercollegiate Broadcasting System. Artists interested in submitting material should write to P.I.B.E. c/o WCVF AM & FM, Gregory Hall, SUNY College, Fredonia, NY 14063.

"THE BUG" - A Portable Electroacoustic Percussion Board. You can have a whole percussion orchestra at your fingertips in the space of only two square feet! The Bug, with its assortment of rods, nails, combs, springs and strings, will delight your ear and amaze your friends and fellow musicians. Almost any contact mic and amplification system may be used. The price for direct orders is $150.00 plus shipping. To order, write Tom Nunn, 3016 15th Street, San Francisco, CA 94110, or call (415) 282-1562.

The Northern California Chapter of the American Bamboo Society is hiring an artist who works with bamboo to present their work. Any medium is suitable. Contact Richard Waters, 1462 Darby Rd., Sebastopol, CA 95472.

Cassette tapes by the group Plateau, mentioned in EMI's last issue's discography of music for experimental instruments, are available for $5 from Plateau, 7 Coso Ave., San Francisco, CA 94110. An **Anthology of Repetica Vol. I** contains excerpts from a live performance originally broadcast over KPFA radio.

New Music America 1987, the leading festival for new music in the United States, opens Friday, October 2nd and runs until Sunday the 11th in Philadelphia. There appears to be less emphasis on instrument installations and explorations than there has been in some past years, but there is plenty of interesting material nonetheless. For more information contact NMA 87, PO Box 19209, Philadelphia, PA 19143.

PASIC '87, this year's edition of the Percussive Arts Society's international convention, takes place in St. Louis October 29 - November 1. For more information contact the Percussive Arts Society, 214 W Main St., Box 697, Urbana, IL, 61801-0697.

DID YOU GET THE NEW EMI TAPE YET? From the Pages of EMI Vol. II contains the music of instruments featured during our second year of publication. Its predecessor, **Volume I**, covers our first year. Great stuff in both cases. Each cassette tape is $6 for subscribers; $8.50 for non-subscribers, from EMI, Box 784, Nicasio, CA 94946.

RECENT ARTICLES APPEARING IN OTHER PUBLICATIONS

Listed below are selected articles of potential interest to readers of **Experimental Musical Instruments** which have appeared recently in other publications.

OBJECTIVE: MUSIC SIMPLIFIED by Daniel E. Harmon, in **The Hornpipe** Vol. 4 #2, July/August 1987 (PO Box 1618, Lexington, SC, 29072).

This article describes the work and the philosophy of Dick Bozung, a music therapist, music educator and instrument builder living in South Carolina. Bozung creates instruments designed to provide rewarding musical experience for anyone, with a minimum of training or musical background required. Among his instruments are Sunflower, a circular instrument with elements of autoharp and xylophone; Finch, an interchangeable fretboard instrument with elements of guitar, cello and dulcimer; Sparrow, a xylophone with movable key markers, and many more.

THE PIDDER PADDER OF FLUTE PADS by Michael A. Greer, in **Techni-com** Volume 11 #2, April-May 1987 (PO Box 51, Normal, IL 61761).

Michael Greer is an employee of Powell Flutes, and has taken part in current research into flute key padding materials being done there. In this report he discusses the physical qualities that make for pads that will seal effectively and won't wear quickly; describes the materials currently in use (felt and cow intestine); and looks to future possibilities, including the development of synthetic pads. He outlines the difficulties in convincing any manufacturer to do the research and tool up for new designs and materials given the fact that repair people and players are likely to be suspicious of unproven new approaches.

ORIGINAL INSTRUMENT, MODERN COPY, RE-CREATION WITH MODERN TECHNIQUE, OR MODERN INSTRUMENT? by Franz Xavier Streitwieser, in **Newsletter of the American Musical Instrument Society** Vol. XVI #2, June 1987 (AMIS, c/o The Shrine to Music Museum, 414 E. Clark St., Vermillion, SD, 57069-2390).

Baroque composers often wrote horn and trumpet parts in a range above the reach of contemporary musicians playing modern instruments. A form of small trumpet has been available to modern musicians to play those trumpet parts, but until recently the high horn parts had been set aside as unplayable. This article describes the clarinhorn, a small horn recently designed and built by the author and German builder Hans Gillhaus, bringing the high horn parts within reach once again. The new-old instrument is modeled after an early horn used in playing Bach's cantatas at Leipzig. The new version has four modern valves, and is played, according to baroque tradition, without the hand in the bell, to produce a brighter timbre.

The "Viewpoint" section on **High Performance** #38 (240 S. Broadway, 5th Floor, Los Angeles, CA 90012) contains quick reviews of two performances using unusual instruments:

Christian Marclay at Roulette in NYC in March gave one of his advanced turntables performances, manipulating by hand multiple record turntables with records of various musical genres. Interestingly, also included in the show (if I read the reviewer's description correctly) was a live performance by a brass quartet playing a transcription of what was originally an audio recording of one of Marclay's real time turntable performances.

Logos-Duo performed in April in Santa Barbara, blending the human voice with a variety of clever low-tech electronic gadgetry, including a synthesizer manufactured entirely from gambling machine components. The performance integrates elements of audio, visual and dance through various technologies including holography.

American Lutherie Number 10, Summer 1987 (8222 S. Park Ave., Tacoma, WA 98408), is full of interesting material. In an article on the Guild of American Luthiers (the organization which sponsors **American Lutherie** magazine) appearing in EMI Vol. I #3, we commented that the guild was, de facto, primarily concerned with guitar construction. This issue of AL certainly belies that description.

In the letters section of AL #10 is a communication from Richard Ennis, describing an acoustic bass guitar (fretted and played horizontally) which he has built. Photos are included. This letter follows an article by Tim Olsen in the previous issue called "Building the Flat Top Bass" which describes a very similar instrument. Apparently we are witnessing the evolution of a distinct new instrument type, chronicled here in the pages of **American Lutherie**.

BUILDING THE VIHUELA AND VIOLA DA MANO FROM HISTORICAL EVIDENCE by John Rollins describes the construction of these two historical instruments. The most interesting aspect of this fine article is the author's exposition of the careful process of interpretation and reasoning that led from limited historical documentation to the ultimate designs of the reproductions. Included along with the text are reproductions of and details from early manuscripts and paintings, as well as photos of the completed instruments and reproductions made recently by another builder.

THE HAMMERED DULCIMER: ANCIENT, WONDERFUL, AND STILL EVOLVING is a discussion of various forms of hammered dulcimer, from early, relatively simple instruments to the highly evolved cymbalom. The article goes on to discuss a number of explorations and innovations that the author has worked with, including, for instance, tuning the bridges along with the strings. He also makes valuable points regarding different approaches to soundboard construction appropriate to hammered string instruments as opposed to plucked or bowed strings.

(Continued on page 19)